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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/675,263	09/30/2003	Timothy S. Campbell	Campbell 2-8-1-1-1/075903	4026
29391	7590	05/19/2005	EXAMINER ABRAHAM, FETSUM	
BEUSSE BROWNLEE WOLTER MORA & MAIRE, P. A. 390 NORTH ORANGE AVENUE SUITE 2500 ORLANDO, FL 32801			ART UNIT 2826	PAPER NUMBER

DATE MAILED: 05/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

EEC

<b>Office Action Summary</b>	<b>Application No.</b> 10/675,263	<b>Applicant(s)</b> CAMPBELL ET AL.	
	<b>Examiner</b> Fetsum Abraham	<b>Art Unit</b> 2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 28 February 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-35 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 22-35 is/are allowed.
- 6) ☒ Claim(s) the rest is/are rejected.
- 7) ☒ Claim(s) 7,9,13 and 16-18 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

### DETAILED ACTION

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**Claims 1,3,5,6,8,10-12,15,20,21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wu et al (6,720,256) in view of Hori et al (5,445,710).**

As for claims 1,10,15,20 the patent discloses a process of etching material layers (44,42) which are respectively anti-reflective coating and silicon containing layer and making an opening (48) thereby, and exposing the insulation material (33) to fluorine based plasma gas etchant material through the hole (48) to etch a portion of the layer (33) as can be seen in figure 4d. Clearly, after the etching process was performed through the opening to etch the insulating material (33), a portion of the etched material (33) remains to be laterally disposed or present relative to the opening.

Although the processing temperature indicate to be more than 100 degrees centigrade based on the curing process of the overall structure in the primary reference, Hori et al rather discloses the fact that insulation layers are etched by the same process at an ambient exceeding 100 degrees centigrade (see figure 8 and column 7, 20-30). Therefore, it would have been obvious to one skilled in the art to apply the etching process of the primary reference at a temperature ranging between 250-450 degrees) as suggested by the secondary reference, since the improved method results in a better final product that copes well with the increased degree of integrated circuits (see

column 1, 40-50), and to avoid etching induced problems associated with other methods such as those taught in columns 1 and 2).

As for claim 15, said "without compromising the integrity of the semiconductor device" is met by the prior arts since neither was there any detectable damage to any of the layers in the structure nor did the patents teach of such a result from the processes.

As for claim 3, the openings in the prior arts are vertical trenches.

As for claim 5, every exposure including those in the prior arts must be adjusted to control the intended target, errors of margin and lateral etching with relative precision.

As for claim 6, so far as understood, the etched material of the primary reference is an insulator and insulators are known sacrificial layers in the art.

As for claim 8, one of the etched layers (42) in the primary reference is a material selected from an oxide and the material itself, layer 33 is an insulator that could be any one of the claimed materials. Further, the substrate (30) is silicon.

As for claims 11,21 Figure 4d shows an upper layer (40) and a lower layer (32) at the etched location, which is shown in figure 4e after the etching process. In that structure and in the etched section of the structure, upper layer (40) and lower layer (32) are decoupled.

As for claim 12, the material or layer (33) is a sacrificial insulation layer from broader point of view and after the material is exposed to the etchant gas, a portion or the upper region of the material (33) is removed.

**Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wu et al (6,720,256) in view of Hori et al (5,445,710) and further in view of Shen (6,693,038).**

The primary references discloses all subject matter claimed but may be silent on claimed NF<sub>3</sub> comprised in the fluorine gas in the teachings. However, Shen teaches that NF<sub>3</sub> was a known component of fluorine based etchant gas in column 2, 25-35. Therefore, it would have been obvious to use the gas with the compound composition since the union results in producing effective etchant gas material favorable for etching various types of semiconducting oriented materials.

**Claims 4,19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wu et al (6,720,256) in view of Hori et al (5,445,710) and further in view of Miyakawa (6,342,449).**

The prior arts disclose all subject matter claimed but could have been silent about the claimed high aspect ration. However, Miyakawa teaches the fact that high aspect ratios of contact holes, grooves or openings was mandatory particularly for minute semiconductor devices (see column 6, 19-30). Therefore, it would have been obvious to one skilled in the art to make a hole or a trench in any semiconductor oriented structure with a high aspect ration for the same reason/advantage provided by Miyakawa.

As for the claimed 50:1 ratio, the ratio is a notoriously known variable that depends on the desired level of contact conductance, stability, overall structure size, and reliability that changes from a design to another.

**Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wu et al (6,720,256) in view of Hori et al (5,445,710) and further in view of Ueno et al (4,560,458).**

The prior arts disclose all subject matter claimed but omit to teach how the fluorine-based plasma was formed. However, Ueno et al discloses the fact that such gases are can be formed at a pressure of 10 Torr. Therefore it would have been obvious to one skilled in the art to form the claimed product at the pressure taught by Ueno et al, since the pressure provides satisfactory gas suitable for etching.

**Claims 7,9,13,16,17,18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.**

The selected materials as the material to be etched by the claimed etchant material and process were not available by the search result.

As for claim 16, although it is clear that the ratio is a variable element that varies depending on gas concentration, the energy, temperature and pressure applied in the process the search report did not produce the claimed ratio for examination to consider it otherwise.

**Claims 22-35 have been allowed.**

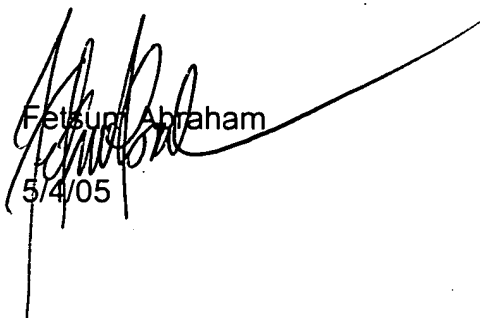
The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Refer to PN: 6,827,869, specifically column 13, 36-45 where the patent considers an aspect ratio greater than 50:1 as very high).

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The claimed process of forming a contact that includes the claimed steps in order and the lateral etching through the sacrificial layer and etching at least a portion of said sacrificial layer disposed laterally with respect to said opening and forming a conductive material in the etched portion of the sacrificial layer was not taught or rendered obvious by the prior arts.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fetsum Abraham whose telephone number is: 571-272-1911. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on 571-272-1915.

  
Fetsum Abraham  
5/4/05